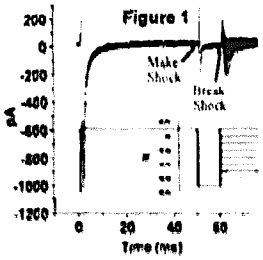
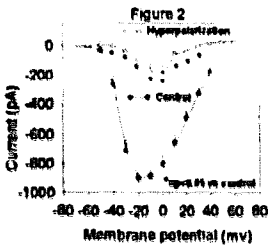


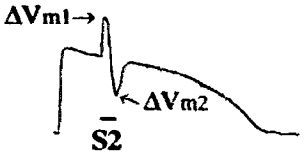


Conclusion: Hyperpolarizing the cell membrane during action potential plateau activates sodium channels at break shock but at a greatly reduced level. This may return Vm to a more depolarized potential thereby prolonging AP duration and refractoriness.

1047-176 Transmembrane Potential Change Caused by a Biphasic Shock

X. Zhou, W.M. Smith, R.K. Justice, R.E. Ideker. *University of Alabama at Birmingham, Birmingham, AL, USA*

The charge burping model attributes the low defibrillation threshold (DFT) of the biphasic waveform to the removal of excess charge by the 2nd phase. This model predicts that the transmembrane potential change (ΔVm) for the best biphasic waveforms is depolarization during the 1st phase followed by return of Vm during the 2nd phase back to its starting value just before the 1st phase. To test this prediction, ΔVm during a biphasic shock known to have a low DFT was recorded in 4 guinea pig papillary muscles by a double-barrel microelectrode which eliminated the shock artifact. Following 10 S1 stimuli a 5/5 ms biphasic truncated exponential S2 shock (6 ms time constant) of 4–8 V/cm was given during the plateau of the last S1 action potential. For shocks that depolarized the membrane potential during the 1st phase, ΔVm1 was the voltage difference between Vm just before the shock and the maximum Vm during the 1st phase. ΔVm2 was the voltage difference between Vm just before the shock and the minimum ΔVm during the 2nd phase.



Results: ΔVm1 was 51 ± 15 mV and ΔVm2 was 44 ± 23 mV ($p < 0.05$ vs. 0 mV). Thus, because of the nonlinear rectifying properties of the cell membrane, hyperpolarization during the 2nd phase is almost as large as depolarization during the 1st phase (Fig). These findings do not support the charge burping model which predicts that ΔVm2 should be near zero for an efficacious biphasic waveform.

1047-177 Absence of Prevalence-Incidence Bias in the Antiarrhythmic vs. Implantable Defibrillator (AVID) Trial

S.L. Pinski, R.L. Page, J.P. Mounsey, H.-T. Shih, S. Lancaster, E. Graham-Renfroe, Q. Yao. *The AVID Investigators; Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL; University of Washington, Seattle, WA, USA*

Prevalence-incidence bias can limit the generalizability of clinical trials. It consists in the distortion of the clinically relevant cohort of incident cases by the preferential inclusion of "available" prevalent cases with better prognosis. AVID was a multicenter randomized trial comparing ICDs vs. antiarrhythmic drugs in 1,016 survivors of cardiac arrest or hemodynamically compromising VT. In clinical practice, the definitive treatment of these pts is generally decided during the first week after the event, but the AVID enrollment window of up to 6 months opened the possibility for prevalence-incidence bias. We compared the baseline characteristics and outcome of AVID "incident" pts randomized within the first week (INC: n = 576) and "prevalent" pts randomized ≥8 days after the index event (PREV: n = 440). PREV pts were more likely to have a prior history of VF (7% vs. 2%; $p < 0.001$), to undergo CABG (11% vs. 6%; p = 0.001) or PTCA (5% vs. 2%; p = 0.009) after the index episode, to belong to a minority (17% vs. 10%; p = 0.002) and to be treated at a VA hospital (13% vs. 8%; p = 0.01), and less likely to have private insurance (33% vs. 41%; p = 0.01) or prior MI (63% vs. 70%; p = 0.001). Despite these differences, 2-year survival was not significantly different (81 ± 4% in INC vs. 76 ± 5% in PREV; p = 0.26; log-rank test), even after adjusting for baseline variables and discharge treatment.

Conclusions: In AVID, the time from the index event to randomization depended partially on clinical, demographic and institutional factors. However, pts randomized later after the index event did not represent a lower-risk group.

1047-178 Variance of Monophasic Upper Limit of Vulnerability Measurements in Patients Undergoing Active Can Implantable Cardioverter Defibrillator Implantation

K.A. Ellenbogen, M.A. Wood, D.M. Gilligan, D.K. McClish, W.B. London. *Medical College of Virginia, Richmond, VA, USA*

Background: Measurement of upper limit of vulnerability (ULV) with monophasic T wave shock has been proposed as a patient (pt) specific measurement of defibrillation efficacy that results in fewer shocks than measurement of a defibrillation efficacy curve.

Methods: We sought to determine the magnitude of variance in ULV in 63 consecutive pt undergoing ICD implantation. We measured ULV as the strength at or above which ventricular fibrillation is not induced when a stimulus is delivered 310 ms after an 8 beat ventricular pacing drive train at 400 ms. We measured defibrillation threshold (DFT) in pt with an active can device using a biphasic wave form and the binary search method.

Results: The mean age was 63 ± 12 years, and mean ejection fraction was 35 ± 15%. The mean ULV was 8.7 ± 5.4 joules (J) and the mean DFT was 10.0 ± 4.9J. Each pt had 4.5 ± 0.8 ULV measurements. Monophasic ULV correlated poorly with biphasic DFT (R = 0.27, p = 0.04). Change in ULV was calculated from the first to second, second to third, third to fourth and first to last measurements. The mean % of pt with no change was 30%, with a change of 1–3 J was 57%, and with a change of 3 J was 13%. The intraclass correlation coefficient of reliability was 0.21 which indicates a large variance in the measurement of ULV.

Summary: Monophasic ULV's do not correlate well with biphasic active can DFT's. High DFT's were predicted by high ULV's, but a considerable variation in the acute measurement of ULV exists. These findings have important implications for research using ULV.

1048 Prognostic Utility of Echocardiography

Monday, March 30, 1998, Noon–2:00 p.m.
Georgia World Congress Center, West Exhibit Hall Level
Presentation Hour: Noon–1:00 p.m.

1048-113 Prospective Evaluation of the Utility of Echocardiography in the Evaluation of Patients With Syncope

A.G. Olatidoye, A. Paszczuk, L.V. Carl, R. Powers, C. Chen, L.D. Gillam. *Hartford Hospital, Hartford, CT, USA*

White echocardiography (2DE) is often used to evaluate patients (pts) with syncope its utility in this area is not well defined. Indeed, the current ACC/AHA Guidelines for the Clinical Application of Echocardiography note a "strong need" for a large prospective study in this area. To address this issue, 258 consecutive pts (age 67 ± 18 yrs) admitted to the emergency department with syncope were evaluated with 2DE. 2DE findings were reviewed in the context of clinical data including history, physical examination, EKG, and, when available, Holter and/or electrophysiologic evaluation. The diagnostic yield of 2DE was categorized as: I - identified abnormality felt to be sole cause of syncope, II - identified abnormality contributing to syncope in pts with co-existent arrhythmia, III - demonstrated no pertinent abnormality.

Results: The diagnostic yield was I - 7.8%, II - 12%, III - 80.2%. 2DE diagnoses in category I included severe aortic stenosis, IHSS, severe pulmonary hypertension, and acute pulmonary embolism. Category II patients included those with mild to moderate AS, acute myocardial infarction, moderate to large pericardial effusion, and previously unsuspected left ventricular dysfunction in whom ventricular or atrial arrhythmia was demonstrated.

Conclusions: In pts with syncope, 2DE provides useful diagnostic information in 19.8%. In 7.8%, this information is diagnostic. These data support a role for 2DE in pts with syncope. However in pts in whom a non-cardiac cause of syncope is apparent and there is no clinical suspicion of heart disease, the test may be inappropriate.

1048-114 Diagnostic Utility of Echocardiography in Evaluation of Syncope

R.F. Redberg, R. Ferguson, J.P. Miller, L.W. Lissin, M.C. Dam. *University of California San Francisco, USA*

Background: Syncope results in [illegible]% of hospital admissions and 3% of emer-

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gency room visits annually. Echocardiography is commonly included in the work-up of this population. The purpose of this study is to determine the diagnostic yield of echo in the evaluation of syncope.

Methods: Medical records of 117 consecutive patients with an admission diagnosis of syncope (ICD-9: 780.2) were reviewed. Fifteen were excluded due to misdiagnoses.

Results: The mean age was 69 ± 14 years (range 21–101). Sixty-five percent were male. The two most frequent diagnostic tests performed were ECG (94%) and echo (87%). Abnormalities were observed in 60% of echoes and 58% of ECGs. Abnormal echo findings included 12 cases of aortic stenosis, 66 cases of valvular insufficiency and one case of idiopathic hypertrophic subaortic stenosis. Thirty-three percent of patients demonstrated at least moderate reduction in left ventricular function. Regional wall motion abnormalities were noted in 18 patients, 82% involving the inferior wall. The most common etiologies for syncope were cardiac arrhythmias (39%) and reflex mediated causes (19%).

Conclusion: These data suggest a high prevalence of abnormal echo findings in patients presenting with syncope, most commonly valvular abnormalities and/or myocardial dysfunction. The prevalence of LV dysfunction and regional wall motion abnormalities, especially in the inferior wall raise the question of transient AV node ischemia (with subsequent arrhythmia) as a cause of syncope. This finding warrants further investigation in a prospective fashion. Although there is a high prevalence of abnormal echo findings in older patients presenting with syncope, the diagnostic value is low. The predictive value of a normal echo in the elderly patient with syncope remains to be determined.

1048-115 Echocardiographic Wall Motion Abnormality or Serum Troponin I for Predicting Prognosis in Patients With Unstable Angina

A.G. Olatidoye, L. Ford, Y.-J. Feng, A.H.B. Wu, L.D. Gillam, D. Waters, C. Chen. *Hartford Hospital, University of Connecticut, Hartford, CT, USA*

Elevated serum Troponin I (cTnI) predicts poor prognosis in patients (pts) with unstable angina (UA). However, this observation has not been correlated to echocardiographic wall motion abnormality (WMA), a marker of infarcted, ischemic, stunned or hibernating myocardium. To compare the predictive value of elevated cTnI with that of WMA for major cardiac events, we analyzed the data on 109 consecutive pts admitted with acute coronary syndrome (males: 55%, ejection fraction: 44 ± 16%). Pts with prior myocardial infarction (MI) were excluded. Serum cTnI levels were obtained at admission while echocardiography was performed within 24 hours of admission. Of 109 pts, 47 ruled in for acute MI while 62 had a final diagnosis of UA. Serum cTnI was elevated in 9 UA pts (14.5%) while WMA was present in 38 UA pts (61.3%, $p < 0.01$). All 9 pts (100%) with elevated cTnI had WMA while 29 of 53 pts (54.7%) with normal cTnI had WMA. No pt without WMA had elevated cTnI. At 12 ± 5 months follow-up, pts with WMA had experienced significantly more cardiac events (recurrent MI, hospitalization, revascularization, and death) than pts without WMA (31.6% vs 4.2%, $p < 0.01$). The sensitivity, specificity, and positive predictive value for cardiac events were 92%, 47%, and 32% for WMA, and 13%, 84%, and 33% for elevated cTnI.

Conclusions: Echocardiographic regional WMA appears to be more sensitive than serum cTnI in predicting major cardiac events in pts with UA. Further studies with larger number of pts are needed to confirm this finding.

1048-116 Is Mitral Valve Prolapse More Benign in a General Population? Reevaluation of Echo Features in the Framingham Heart Study

L.A. Freed, E.J. Benjamin, D. Levy, M.G. Larson, J.C. Evans, D.L. Fuller, B. Lehman, R.A. Levine. *Massachusetts General Hospital, Boston, MA; NHLBI's Framingham Heart Study, Framingham, MA, USA*

The echo features of mitral valve prolapse (MVP) have been characterized in hospital-based populations by the frequent occurrence of significant mitral regurgitation (MR) and left atrial (LA) enlargement. To examine the echo features of MVP in an unselected population, we studied all subjects with possible MVP (n = 151) and 151 age- and sex-matched controls from the Framingham Study. Maximal mitral leaflet (ML) superior displacement in systole (D) and leaflet thickness in diastasis (T) were measured. The subjects were classified as classic MVP (D > 2 mm, T ≥ 2.5 mm), nonclassic MVP (D > 2 mm, T < 5 mm), or no MVP (D ≤ 2 mm), and their associated features were compared (height- & sex-adjusted least-squares means) (table).

Conclusions: Although the Framingham MVP subjects are significantly distinct from the no MVP group, they display a more benign form of MVP than reported in hospital-based studies.

MVP Status:	*Classic n = 46*	*Nonclass n = 37*	*No MVP n = 219*	*p* value*
ML thickness	6 mm	4 mm	4 mm	0.0001
LA diameter	33 mm	31 mm	30 mm	0.0011
MR (jet/LA area) (%)	15.1 (mild)	8.7 (trace)	2.6 (trace)	0.0001
Anterior ML length	24 mm	22 mm	19 mm	0.0001
Posterior ML length	15 mm	14 mm	12 mm	0.0001

*p-value compared classic + nonclassic MVP to no MVP group

1048-117 Aortic Supravalvular Debris Identified by Transthoracic Echocardiography Predicts Cerebral Embolic Events

V. Kaushik, C. Ahn, E. Barasch. *The University of Texas Medical School at Houston; Hermann Hospital, Houston, Texas, USA*

Background: Studies done at autopsy or by transesophageal or epiaortic intraoperative echocardiography, indicated that the presence of atherosclerotic plaques in the aortic arch is an independent risk factor of cerebral embolic events. We found in a number of patients (pts.) studied by *transthoracic echocardiography*, irregular small echogenic masses in the aortic root localized mainly above the aortic valve, consistent with aortic atherosclerotic debris. Based on this observation, we sought to assess the prevalence of embolic strokes in pts. with supravalvular aortic debris.

Methods: From our echo database, we identified, 58 pts. (Gr.1), evenly gender distributed, mean age 67 ± 12 yrs, on whom aortic supravalvular debris were found on transthoracic echo. This group was compared with 58 pts. (Gr.2) free of aortic debris, matched for age, gender and risk factors for advanced atherosclerosis. Pts. with atrial fibrillation or thrombus in the cardiac chambers were excluded from the analysis. In 85% of stroke pts., the ischemic stroke was diagnosed by MRI or CT. Chi-square tests were used to examine the prevalence of embolic strokes between the two groups.

Results: There were 19 embolic strokes in Gr.1 (32.8%) and 5 in Gr.2 (8.6%)($p < 0.001$). On carotid Duplex sonography, no significant atherosclerotic changes have been found in either group.

Conclusion: 1. Pts. with aortic supravalvular debris detected on transthoracic echocardiogram have a fourfold increase in the prevalence of embolic strokes. 2. The presence of debris in the aortic root may explain cerebral embolism and the need for preventive therapy warrants further investigation.

1048-118 Predictive Value of Transthoracic Echocardiography Before Noncardiac Surgery

L.E. Rohde, C.A. Polanczyk, L. Goldman, R.T. Lee, T.H. Lee. *Brigham and Women's Hospital, Boston, MA, USA*

Background: Transthoracic echocardiography (TTE) is frequently ordered before noncardiac surgery, although its value to predict perioperative cardiac complications is still controversial.

Methods: To evaluate the independent predictive value of TTE, we studied 570 patients who underwent TTE within 3 months prior to noncardiac surgery. Data from detailed clinical history, physical examination, electrocardiographic (ECG) and laboratory studies were routinely collected.

Results: In univariate analysis, any degree of preoperative systolic dysfunction was associated with postoperative myocardial infarction (odds ratio [OR], 2.8 [95% CI, 1.1 to 7]), congestive heart failure (OR, 3.2 [1.4 to 7]), major cardiac complications (OR, 2.4 [1.3 to 4.5]) and any cardiac-related complications (OR, 2.2 [1.4 to 3.6]). Moderate to severe LV hypertrophy was associated with myocardial infarction (OR, 3.1 [1.1 to 8.3]) and with major cardiac complications (OR, 2.2 [1.1 to 4.3]). In logistic regression analysis, models with echocardiographic parameters predicted major cardiac complications significantly better than those that included only clinical variables (ROC curve 0.66 vs. 0.72; $p < 0.001$). Even in this selected population, 75% of TTE had normal LV function. Clinical correlates of a TTE with normal resting LV function were female gender and the absence of previous myocardial infarction, congestive heart failure and Q waves on the ECG. Among 116 patients with these characteristics, 111 (96%) had normal LV function.

Conclusions: In this population, TTE parameters were independent predictors of cardiac complications after noncardiac surgery. Simple clinical features can help to identify patients with normal LV function and strategies should be developed to identify subsets of patients for whom TTE is an appropriate preoperative test.